

PATENT ABSTRACTS OF JAPAN

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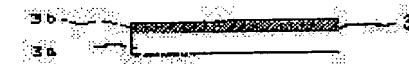
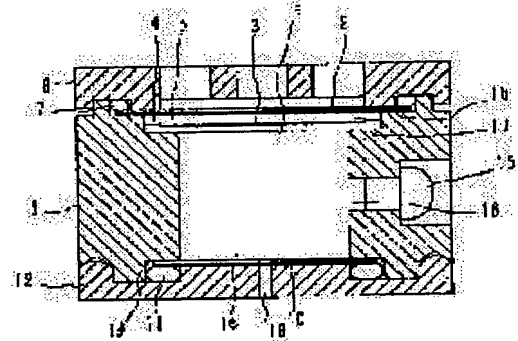
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(54) ELECTROCHEMICAL GAS DETECTOR

(57)Abstract:

PURPOSE: To flow an electrolyte to the electrode surface without using a string-shaped liquid-guiding member through the electrode.

CONSTITUTION: In an electrochemical gas detector for detecting the concentration of a gas to be detected as an electrolytic current by allowing at least an action pole and an opposite pole to contact an electrolyte, a water-containing plate 5 is allowed to contact an electrode surface 2b of an electrode body 2 which becomes the action pole and is housed in a container 1 by enclosing in sandwich with the water-containing plates 4 and 5 for contacting at both front and rear surfaces of the electrode body 3 which becomes the opposite pole and the periphery part. An electrolyte is sucked via the water-containing plate 4 and the electrolyte is routed to the water-containing plate 5 which exists between the electrode bodies 2 and 3 from the periphery part of the water-containing plate 4, thus causing the electrode surfaces 2b and 3b of both electrode bodies 2 and 3 to contact the electrolyte and generating an electrolytic current corresponding to the concentration of the gas. Then, when the electrolyte is included in the water-containing plates 4 and 5, gas can be detected and the electrolyte in the container can be reduced as much as possible, thus absorbing the increase and decrease in the electrolyte due to moisture at a space which is generated in the container.



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CLAIMS

[Claim(s)]

[Claim 1] In the electrochemical gas sensitive detector which holds in a container and detects the concentration of **ed gas as an electrolytic current so that an operation pole and a counter electrode may be made to **** to the electrolytic solution at least The first water board which can absorb the aforementioned electrolytic solution is inserted by the aforementioned operation pole and the aforementioned counter electrode. Moreover, the electrochemistry formula gas sensitive detector to which the second water board which can absorb the aforementioned electrolytic solution which extends outside the periphery section of the aforementioned counter electrode is made to contact the electrolytic-solution side of the aforementioned counter electrode, and it comes to carry out a part of second water board [at least] in contact with the electrolytic solution.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] the electrochemistry formula gas sensitive detector which this invention makes detected gas act on the electrolytic solution closed by the permeability porous membrane, and detects the concentration of detected gas from the electrolytic current at this time — it is related with the supply technology of the electrolytic solution to an electrode in more detail

[0002]

[Description of the Prior Art] With the electrode board which comes to form electrode material, such as platinum black, in layers, an electrochemistry formula gas sensitive detector closes opening of a container, holds the electrolytic solution and counter electrodes, such as a dilute sulfuric acid, in a cell, and is constituted by the diaphragm equipped with water repellence and permeability like the fluororesin. The electrolytic solution carries out volume change of this detector according to change of the humidity in environment on the relation which uses the liquid which has hygroscopicity, such as a dilute sulfuric acid, as the electrolytic solution, and the oil-level level in a container changes. There is a problem that a pressure will act on an electrode layer, distortion will arise if this change takes place rapidly, and a measurement error arises. That such a problem should be solved, the little amount of electrolytic solutions is held in the interior of a cell, and the electrochemistry formula gas sensitive detector to which liquid junction of an electrode board and the electrolytic solution was carried out by the watering member of the shape of a string equipped with absorptivity is proposed (JP,57-147048,A).

[0003]

[Problem(s) to be Solved by the Invention] watering of the shape of a string for electrode area not only decreasing, but carrying out the liquid junction of the electrolytic solution and the electrode, since the through-hole for letting a watering member pass needs in the center of the electrode board which serves as a counter electrode in order to draw a watering member to an operation pole, although it can respond to the change in the electrolytic solution which lessens the electrolytic solution as much as possible, and originates in environmental humidity if such a watering member uses — the problem that where of insertion work of a member is needed and a manufacturing process is complicated is

[0004]

[Means for Solving the Problem] In order to solve such a problem, it sets to this invention. In the electrochemical gas sensitive detector which holds in a container and detects the concentration of **ed gas as an electrolytic current so that an operation pole and a counter electrode may be made to **** to the electrolytic solution at least Insert the first water board which can absorb the aforementioned electrolytic solution by the aforementioned operation pole and the aforementioned counter electrode, and the second water board which can absorb the aforementioned electrolytic solution which extends outside the periphery section of the aforementioned counter electrode is made to contact the electrolytic-solution side of the aforementioned counter electrode, and it was made to carry out a part of second water board [at least] in contact with the electrolytic solution.

[0005]

[Function] The electrolytic solution is sucked up through the water board which touches the rear face of a counter electrode, and the electrolytic solution turns to the water board which exists between an operation pole and a counter electrode from the periphery section of a water board. By this, the electrode side of the electrode side of an operation pole and a counter electrode will contact the electrolytic solution, and will generate the electrolytic current corresponding to the concentration of gas. Therefore, since operation of a gas sensitive detector will be attained if the electrolytic solution is contained in the water board, it becomes possible to lessen the electrolytic solution held in a container as much as possible, to secure and have space, and to absorb the change in the electrolytic solution by humidity in this space.

[0006]

[Example] Then, based on the example illustrating the detail of this invention, it explains below. Drawing 1 shows one example of this invention, and the sign 1 in drawing is the barrel which constitutes a cell, and can fix now the frames 2 and 3 furnished with the electrode object later mentioned to opening 1a of an end.

[0007] The vacuum evaporations of the matter which equipped with the catalysis of platinum, a platinum system alloy, etc. one front face of the diaphragms 2a and 3a which consist of a fluororesin which is the electrode object mentioned above, respectively, and was equipped with permeability and water repellence as shown in the drawing 2 (b) and a (b) is carried out, or 2 and 3 mix the impalpable powder of platinum, and the so-called platinum black to a binder, sinter them in layers, they form the electrode sides 2b and 3b, and are constituted. When these touch the electrolytic solution, the electrode object 2 of the side which touches the open air will act [the electrode object 3 of another side as an operation pole] as a counter electrode.

[0008] And 1st level difference section 1b is equipped with it as the electrode object 2 used as the operation pole which contacts **ed gas among the electrode objects 2 and 3 is formed in opening 1a of a barrel 1 by making the diaphragm 2a into an outside. The electrode object 3 used as a counter electrode moreover, on rare ** which puts the glass wool equipped with chemical resistance while absorbing the electrolytic solution, and the sheet metal formed by the cellulose between two water boards 4 and 5 which it comes to form more greatly than the size of the electrode 3 used as a counter electrode In 1d of 2nd level difference section formed so that it might become the height to which it is a lower part and the water board 5 on top touches electrode side 2b from 1st level difference section 1b, it piles up the water boards 4 and 5 and in the shape of sandwiches, it is united, and is caught. Thus, after setting to the electrode object 2, the water board 4, the electrode object 3, and the state where the water board 4 was piled up in layers, O ring 7 is located in the periphery of the electrode object 2 used as an outside, and it is being fixed to the barrel 1 by the fluid-tight state with the frame 8. Moreover, thin lines, such as platinum, are connected to the electrode sides 2b and 3b of each electrode objects 2 and 3, and the electrode sides 2b and 3b are connected to the measuring circuit by pulling out outside through the through-hole which drilled this thin line in the barrel 1.

[0009] Opening 1e of another side of a barrel 1 equips with the criteria pole 10 1f of level difference sections formed here, infixes O ring 11, and is being fixed to the barrel 1 in the state of fluid-tight with the frame 12. In addition, in the sign 15 in drawing, 18 shows an air hole for the plug which closes the electrolytic-solution inlet 16 drilled in the barrel 1 again.

[0010] In this example, if it installs so that the electrode objects 2 and 3 may become perpendicular (drawing 3), some water boards 4 by the side of the electrolytic solution 20 will be immersed in the electrolytic solution 20, and the electrolytic solution 20 will spread to the whole water board 4 with surface tension. Thus, if the electrolytic solution 20 permeates to the periphery of the water board 4, in order that the water board 5 which has touched on the periphery of the electrode object 3 used as a counter electrode may absorb the electrolytic solution 20 of the water board 4, finally the electrode sides 2b and 3b of each electrode objects 2 and 3 constitute an electrolysis cell through the electrolytic solution 20 of the water board 5, and the criteria pole 10 forms an electric conduction relation through the electrolytic solution 20.

[0011] When **ed gas contacts the electrode object 2 in this state, the **ed gas which

passed diaphragm 2a **** on the boundary of this electrode side 2b and the electrolytic solution of the water board 5, and the electrolytic current corresponding to the concentration of gas is made generated among the electrode sides 2b and 3b of the electrode objects 2 and 3.

[0012] Since the electrolytic solution 20 held in the barrel 1 is little although the volume of the electrolytic solution 20 will increase if the humidity of an external environment rises and the electrolytic solution 20 absorbs moisture in this state, the sufficient room 21 is secured and, for this reason, the increment of the electrolytic solution 20 will fully be absorbed in space 21. A part for the pressure buildup of the space gas by increase in quantity of this electrolytic solution 20 will be emitted to the atmosphere from air hole 18 grade. In addition, if the concentration is fallen to a ** grade according to moisture absorption, since absorbency and evaporation balance, the electrolytic solution 20 will maintain the level to constant value.

[0013] on the other hand, by environmental humidity falling, when there was much evaporation of the moisture of the electrolytic solution 20, the electrolytic solution 20 was mentioned above, although the volume was decreased — as — elevation of concentration — following — absorbency — going up — ** — reduction stops in the stage to which the oil level fell to fixed level Since some near water boards 4 which face the electrolytic solution 20 also in this state are still ****(ed) to the electrolytic solution and the electrolytic solution is included in the water board 4 whole, an electrolysis cell will be constituted through the electrolytic solution between electrode side 2b of the electrode objects 2 and 3, and 3b. Since it does not depend for gas-sensitive-detector sensitivity on the concentration of the electrolytic solution and distortion of the electrode objects 2 and 3 accompanying change of humidity moreover is not produced needless to say, either, it can be concerned with the size of humidity and practically sufficient precision [be / nothing] can be maintained.

[0014] In addition, although the example was taken and explained to 3 pole type using the criteria pole 10 in this example, even if it applies to the thing of 2 pole type which consists of an operation pole and a counter electrode, it is clear to do the same operation so. Moreover, although it arranges where the criteria pole 10 is isolated in this example, much more miniaturization can be attained by arranging in the state where it was made to stick through a water board as shown in drawing 4 .

[0015] The example shown in drawing 4 namely, between the electrode object 30 which constitutes an operation pole, the electrode object 31 which constitutes a counter electrode, and the electrode object 32 which constitutes a criteria pole after it inserts the water boards 33 and 34 of bigger size than the electrode objects 31 and 32 used as a counter electrode or a criteria pole, and the criteria pole 32 was alike on the other hand and making the water board 35 contact the spacer for securing the space in which the electrolytic solution is furthermore held — a member 36 — with reservation of permeability further the diaphragm 37 which prevents **** — piling up — these — the periphery section of the upper surface and a base — O rings 38 and 39 — guessing — a case etc. — a pressure-welding state — holding — a spacer — it is made to pour the electrolytic solution into the space secured by the member 36

[0016] Since the pressure welding of each periphery sections 33a, 34a, and 35a of the water boards 33, 34, and 35 is carried out according to this example, the electrolytic solution held in the space of a spacer 36 will be transmitted to the periphery sections 33a, 34a, and 35a of each water boards 33, 34, and 35, will arrive at the electrode side of the electrode objects 30, 31, and 32, and will constitute an electrolysis cell like the above-mentioned.

[0017] Although two or more water boards which sandwich an electrode object are contacted on the perimeter edge in a further above-mentioned example it was shown in the drawing 5 (b) — as — the periphery of the water board 40 — the electrolytic solution — ***** — Heights 40a and 40a and 40a.... which are the grade which can do things being formed, and with the water board 41 of another side which sandwiches an electrode object If it is made to make it contact through these heights 40a and 40a and 40a...., it can prevent that the contact pressure of the periphery section reaches a center section, and the formation of wrinkles can be prevented.

[0018] Furthermore, although the water board is formed in a tabular in an above-mentioned example, as shown in the drawing 5 (b), Through-holes 41a and 41a and 41a.... are prepared in the water board 41 of the side which counters the electrolytic solution, and it becomes possible

to make capacity of a container small by holding the electrolytic solution in these through-holes 41a and 41a and the space formed of 41a..

[0019] Moreover, although it is made to wrap an electrode board in the shape of sandwiches in an above-mentioned example with two water boards which became independent, respectively, even if it forms the water board which applied so that the cellulose which dissolved in pastiness might be protruded to the periphery of an electrode board, was made to dry this, and was united with the electrode object, it is clear to do the same operation so.

[0020] Furthermore, although it is made to support each electrode objects 2 and 3 by the respectively separate level difference section in an above-mentioned example, even if it makes it catch in the common level difference section, it is clear to do the same operation so.

[0021] Moreover, although the electrode object which serves as a counter electrode in an above-mentioned example is formed on the surface of a diaphragm, even if it carries out vacuum evaporation and uses for a substrate the sheet metal which formed the electrode constituent by the matter itself, it is clear to do the same operation so.

[0022] The drawing 6 (b) (b) is what shows other examples of this invention, respectively. the sign 50 in drawing By the water supply member which rounded off and constituted the material equipped with endurance to the electrolytic solution, for example, the filter paper which consisted of glass wool, so that it might become cross-section cyclic In the bulk density of a grade of end-face 50a which the whole always touches the water board 4 mostly, and can secure space 21 in the interior of the barrel section 1 enough, and this example, the inner skin of the barrel section 1 is held in the wrap grade by the monostromatic.

[0023] the state where each part material was attached to the barrel 1 in this example — the electrolytic-solution inlet 16 to the electrolytic solution — optimum dose — getting it blocked — at least — the water boards 4 and 5 and water supply — a member 50 pours in the electrolytic solution of the amount of the grade used as a damp or wet condition, and seals with a plug 15 the water board 4 — water supply — since it is in contact with the end face of a member 50 — water supply — the contact surface with a member 50 — the vas-capillare force — water supply — the electrolytic solution contained in the member 50 is absorbed and the water board 5 which is in contact with this — the vas-capillare force — water supply — the electrolytic solution is absorbed from a member 50 The electrolytic solution of the water supply board 4 is further absorbed by the water absorption board 5, and carries out liquid junction of the operation pole 2 and the counter electrode 3 like the above-mentioned. Thereby, the operation pole 2 and a counter electrode 3 will constitute an electrochemical gas sensor through the electrolytic solution of the water board 5, and make the electrolytic current proportional to the concentration of the gas which touched the operation pole 2 generated.

[0024] by the way, in this example, the inner skin is surrounded inside a barrel 1 — as — water supply, since the member 50 is arranged even if it is in the state where a detector inclines and is installed as shown in drawing 7 , and the electrolytic solution 20 inclines and exists in the corner of a pars basilaris ossis occipitalis — water supply — a member 50 Since the part is always in contact with the electrolytic solution, sucks up the electrolytic solution 20 according to the vas-capillare force and supplies the water boards 4 and 5, even if there is no **** in the posture of a barrel 1, it gets it blocked and the water board 4 has not carried out direct **** at the electrolytic solution 20, the electrolytic solution will always be supplied to the water board 5. As a result, the liquid junction state of the operation pole 2 and a counter electrode 3 is [that there is no **** in the posture of the main part of a detector] always maintainable.

[0025] Since the electrolytic solution 20 held in the barrel 1 although the volume of the electrolytic solution 20 will increase when the humidity of an external environment rises and the electrolytic solution 20 absorbs moisture is little, the sufficient room 21 is secured, for this reason, the increment of the electrolytic solution 20 will fully be absorbed in space 21, and it will be emitted to the atmosphere from air hole 18 grade about the part beyond it.

[0026] on the other hand, by environmental humidity falling, when there was much evaporation of the moisture of the electrolytic solution 20, the electrolytic solution 20 was mentioned above, although the volume was decreased — as — elevation of concentration — following — absorbency — going up — ** — reduction stops in the stage to which the oil level fell to fixed

level this state — the water boards 4 and 5 and water supply — since the electrolytic solution is still contained in the member 50, an electrolysis cell will be constituted through the electrolytic solution between electrode side 2b of the electrode objects 2 and 3, and 3b

[0027] In addition, although considered as the single volume in this example, if constituted in the grade which can secure space to a barrel at a multiple-times volume, the electrolytic solution can be supplied to the electrode objects 2 and 3 much more certainly.

[0028] Moreover, although the form of sheet-like water supply paper was prepared in this example and held in the barrel Rigid intensity is comparatively large. it is like [as shown in drawing 8] a polyolefine system macromolecule — and carry out injection molding of the porosity polymeric materials (for example, "SANFAIN AQ" (registered trademark)) equipped with the hydrophilic property, or Carry out cutting or [carrying out cutting] [sintering ceramic powder in the target configuration] Even if it furthermore reinforces with polymeric materials after constituting the purpose configuration object by the cellulose, it fabricates to tubed at the size which can be held in a container and it uses this as a water supply member, it is clear to do the same operation so.

[0029] Drawing 9 is what blocked the tubed part 52a side which contacts the water board 4 at least by flat-surface section 52b which consists of the same material, it is chosen so that the whole length may be mostly in agreement with the height of the space 21 of a container 1, and it is what used positively the rigidity which the tubed water supply member mentioned above has, and it is constituted in the shape of a cup. Such a water supply member can carry out injection molding of the porosity polymeric materials (for example, "SANFAIN AQ" (registered trademark)) like a polyolefine system macromolecule which rigid intensity was comparatively large and was equipped with the hydrophilic property, they can carry out cutting, it can sinter ceramic powder in the target configuration, it can carry out cutting, or it can be further reinforced with polymeric materials after constituting the purpose configuration object by the cellulose, and can be constituted.

[0030] thus, the water supply which constituted — if a member 52 inserts in the space 21 of the barrel 1 which constitutes the detector as shown in drawing 10 and the electrolytic solution pours in, the electrolytic solution which was transmitted to tubed part 52a which is directly in contact with the electrolytic solution 20, and moved to flat-surface section 52b is absorbed by the water board 4 which is in contact with flat-surface section 52b, moves from the periphery section to a water board 5, and will spread round electrode objects 2 and 3 like the above-mentioned henceforth by the way, water supply — since the upper part in drawing was blocked by flat-surface section 52b and has touched all over the water board 4, a member 52 will prevent that the electrode objects 2 and 3 will always be supported, respond to the curve of the electrode objects 2 and 3 by rapid change of a pressure, and the electrode material 2 and 3 caves in to a space side needless to say — this example — also setting — water supply — since the member 52 is formed in tubed and it has space 52c inside, even if it inserts in space 21, it is clear that the excessive space of the grade which can absorb an increased part of the electrolytic solution by moisture absorption is securable

[0031] In addition, in an above-mentioned example, although tubed part 52a and flat-surface section 52b are formed in one, even if it divides into a tube-like object and the disk which can close opening of this, it constitutes and it uses it, piling these up, it is clear to do the same operation so.

[0032]

[Effect of the Invention] As explained above, in this invention, the first water board which can absorb the electrolytic solution is inserted by the operation pole and the counter electrode. Moreover, since the second water board which can absorb the electrolytic solution which extends outside the periphery section of a counter electrode was made to contact the electrolytic-solution side of a counter electrode and a part of second water board [at least] was carried out in contact with the electrolytic solution The execution area of an electrode not only being made to increase but the work which you drill [work] a through-hole in an electrode and makes it flow through a string-like member becomes unnecessary, and it can attain simplification of a manufacturing process.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the cross section showing one example of this invention.

[Drawing 2] A drawing (b) and a (b) are drawings expanding and showing the polar zone, respectively.

[Drawing 3] It is drawing showing the busy condition of equipment same as the above.

[Drawing 4] It is cross-section structural drawing showing other examples of this invention.

[Drawing 5] A drawing (b) and a (b) are drawings showing other examples of a water board, respectively.

[Drawing 6] A drawing (b) and a (b) are the cross sections of the equipment in which other examples of this invention are shown.

[Drawing 7] It is drawing showing the busy condition of equipment same as the above.

[Drawing 8] water supply — it is the perspective diagram showing other examples of a member

[Drawing 9] a drawing (b) and a (b) — respectively — water supply — it is the perspective diagram and cross section showing other examples of a member

[Drawing 10] It is the cross section showing one example of the detector which used the water supply member same as the above.

[Description of Notations]

1 Barrel

2 Three Electrode object

2a, 3a Diaphragm

2b, 3b Electrode side

4 Five Water board

8 12 Frame

20 Electrolytic Solution

50 Water Supply — Member

[Translation done.]

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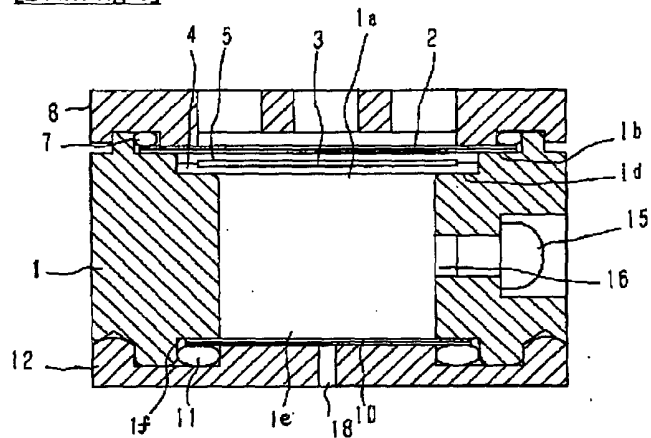
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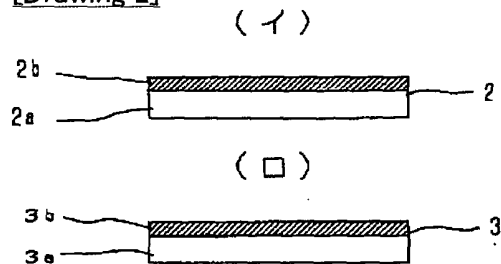
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DRAWINGS

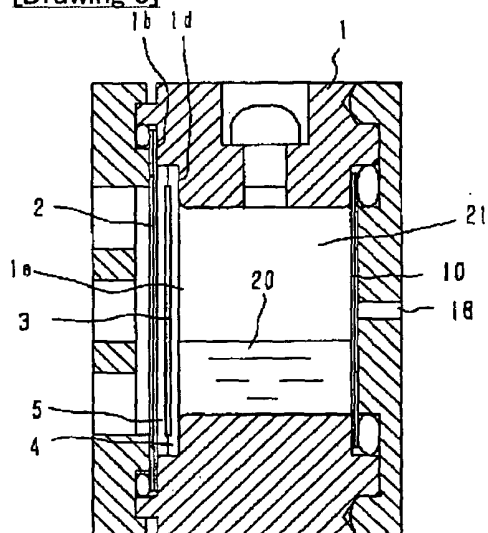
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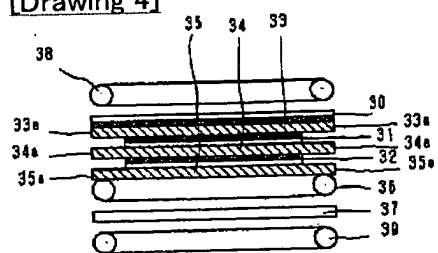
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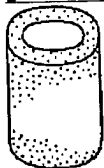
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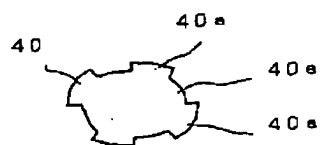
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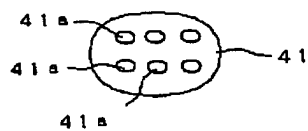
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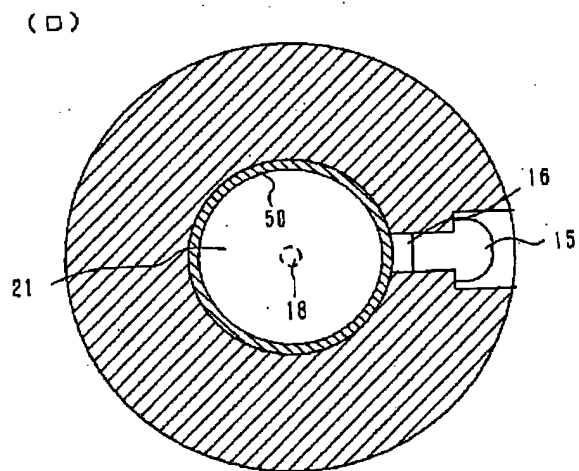
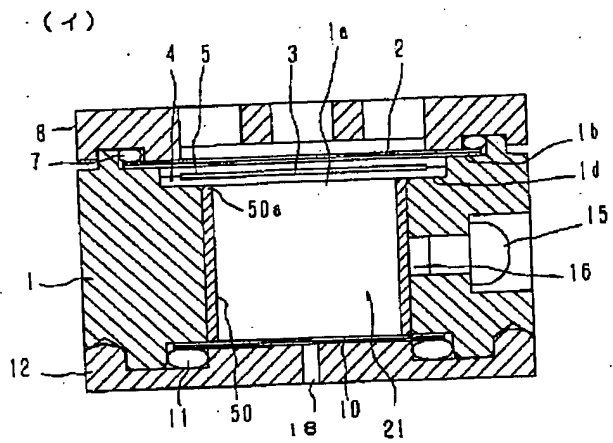
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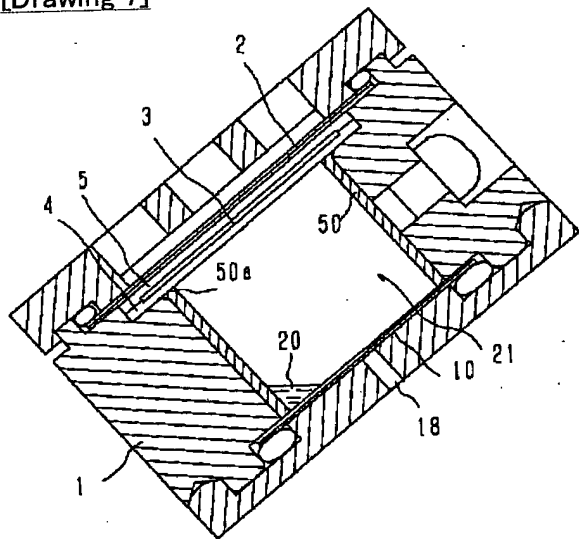
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[Drawing 6]



[Drawing 7]



[Drawing 9]

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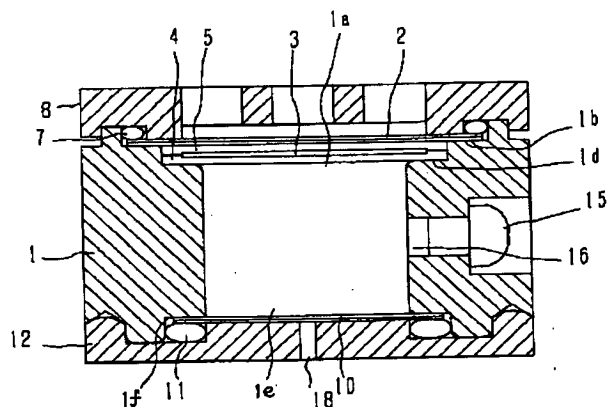
(74)代理人 弁理士 木村 勝彦 (外1名)

(54)【発明の名称】 電気化学式ガス検出器

(57)【要約】

【目的】 電極を貫通する紐状導液部材を用いることなく電解液を電極面に行渡らせること。

【構成】 少なくとも作用極と対極とを電解液に接液させて被検ガスの濃度を電解電流として検出する電気化学的ガス検出器において、対極となる電極体3の表裏両面、及びその周縁部で接しさせるようにして含水板4、5でサンドイッチ状に包み、含水板5を作用極となる電極体2の電極面2bに接触させて容器1に収容する。含水板4を介して電解液20が吸上げられ、含水板4の周縁部から電極体2、3間に存在する含水板5に電解液が回り込む。これにより両電極体2、3の電極面2b、3bが電解液に接触してガスの濃度に対応した電解電流が発生することになる。そして少なくとも含水板4、5に電解液が含まれていればガス検出の動作が可能となるため、容器内に電解液を可及的に少なくでき、これにより容器内に生じた空間で湿度による電解液の増減が吸収される。



【特許請求の範囲】

【請求項1】 少なくとも作用極と対極とを電解液に接液させるように容器に収容して被検ガスの濃度を電解電流として検出する電気化学的ガス検出器において、前記作用極と前記対極とで前記電解液の吸収が可能な第一の含水板を挟み、また前記対極の電解液側には前記対極の周縁部よりも外側に延出する前記電解液の吸収が可能な第二の含水板を当接させ、第二の含水板の少なくとも一部を電解液に接しさせてなる電気化学式ガス検出器。

【請求項2】 少なくとも作用極と対極とを電解液に接液させるように容器に収容して被検ガスの濃度を電解電流として検出する電気化学的ガス検出器において、前記作用極と前記対極とで前記電解液の吸収が可能な第一の含水板を挟み、また前記対極の電解液側には前記対極の周縁部よりも外側に延出する前記電解液の吸収が可能な第二の含水板を当接させるとともに、前記電解液の吸収が可能で、かつ少なくとも一部が前記電解液に接する給水部材を第2の吸水板に接しさせて前記容器内に収容してなる電気化学式ガス検出器。

【請求項3】 前記給水部材は、筒状体として構成され、少なくとも一方の開口を平面により封鎖したカップ状に形成されていて、前記平面が第2の含水板に常時当接している請求項2の電気化学式ガス検出器。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、通気性多孔質膜により封止された電解液に被検出ガスを作用させて、この時の電解電流から被検出ガスの濃度を検出する電気化学式ガス検出器、より詳しくは電極への電解液の供給技術に関する。

【0002】

【従来の技術】電気化学式ガス検出器は、フッ素樹脂などのように撥水性と通気性を備えた隔膜に、白金黒などの電極物質を層状に形成してなる電極板により、容器の開口部を封止し、セル内に希硫酸などの電解液と対極とを収容して構成されている。この検出器は、電解液として希硫酸など吸湿性を有する液体を使用する関係上、電解液が環境中の湿度の変化に応じて体積変動して、容器内の液面レベルが変化する。この変化が急激に起ると電極膜に圧力が作用して歪が生じ、測定誤差が生じるという問題がある。このような問題を解消すべく、セル内部に少量の電解液量を収容して電極板と電解液とを吸水性を備えた紐状の導水部材により液絡させた電気化学式ガス検出器が提案されている（特開昭57-147048号公報）。

【0003】

【発明が解決しようとする課題】このような導水部材を用いれば電解液を可及的に少なくして環境湿度に起因する電解液の増減に対応できるが、導水部材を作用極まで導くために対極となる電極板の中央に導水部材を通すた

めの通孔を必要とするため、電極面積が減少するばかりでなく、電解液と電極とを液絡させるための紐状の導水部材の挿通作業が必要となって製造工程が複雑化するという問題がある。

【0004】

【課題を解決するための手段】このような問題を解消するために本発明においては、少なくとも作用極と対極とを電解液に接液させるように容器に収容して被検ガスの濃度を電解電流として検出する電気化学的ガス検出器において、前記作用極と前記対極とで前記電解液の吸収が可能な第一の含水板を挟み、また前記対極の電解液側には前記対極の周縁部よりも外側に延出する前記電解液の吸収が可能な第二の含水板を当接させ、第二の含水板の少なくとも一部を電解液に接しさせるようにした。

【0005】

【作用】対極の裏面に接する含水板を介して電解液が吸上げられ、含水板の周縁部から作用極と対極との間に存在する含水板に電解液が回り込む。これにより作用極の電極面と対極との電極面とが電解液に接触しガスの濃度に対応した電解電流を発生することになる。したがって、含水板に電解液が含まれていればガス検出の動作が可能となるため、容器内に収容する電解液を可及的に少なくして空間を確保し、もって湿度による電解液の増減をこの空間で吸収することが可能となる。

【0006】

【実施例】そこで以下に本発明の詳細を図示した実施例に基づいて説明する。図1は、本発明の一実施例を示すものであって、図中符号1は、セルを構成する筒体で、一端の開口1aに後述する電極体を取付ける枠体2、3が固定できるようになっている。

【0007】2、3は、それぞれ前述した電極体で、図2（イ）、（ロ）に示したように通気性と撥水性を備えたフッ素樹脂などからなる隔膜2a、3aの一方の表面に白金や、白金系合金等の触媒作用を備えた物質を、蒸着したり、白金の微粉末、いわゆる白金黒を粘結剤に混合して層状に焼結して電極面2b、3bを形成して構成されている。これらは電解液に接すると、外気に触れる側の電極体2が作用極として、また他方の電極体3が対極として作用することになる。

【0008】そして、電極体2、3の内、被検ガスに接触する作用極となる電極体2は、その隔膜2aを外側とするようにして筒体1の開口部1aに形成され第1の段差部1bに装着されている。また対極となる電極体3は、電解液を吸収するとともに耐薬品性を備えたガラスウールや、セルロースで形成された薄板を、対極となる電極3のサイズよりも大きく形成してなる2枚の含水板4、5に挟み込まれた上で、第1の段差部1bより下方で、かつ電極面2bに上面の含水板5が接する高さとなるように形成された第2の段差部1dにおいて含水板4、5とサンドイッチ状に重ね合わされて受止められて

いる。このように電極体2, 含水板4, 電極体3, 及び含水板4を層状に重ね合わせた状態にセットした後、外側となる電極体2の周縁にリング7を位置させて枠体8により筒体1に液密状態に固定されている。また各電極体2, 3の電極面2b、3bには白金等の細線が接続されていて、この細線を筒体1に穿設した通孔を通して外部に引出すことによって電極面2b、3bが測定回路に接続されている。

【0009】筒体1の他方の開口部1eは、ここに形成された段差部1fに基準極10を装着してリング11を介装して枠体12により筒体1に液密状態で固定されている。なお、図中符号15は、筒体1に穿設された電解液注入口16を封止する栓体を、また18は通気孔を示す。

【0010】この実施例において、電極体2, 3が垂直となるように設置すると(図3)、電解液20側の含水板4の一部が電解液20に浸漬され、表面張力により電解液20が含水板4の全体に広がる。このようにして含水板4の周縁まで電解液20が浸透すると、対極となる電極体3の外周で接している含水板5が含水板4の電解液20を吸収するため、最終的には各電極体2, 3の電極面2b、3bが含水板5の電解液20を介して電解電池を構成し、また電解液20を介して基準極10とも導電関係を形成する。

【0011】この状態で被検ガスが電極体2に接触すると、隔膜2aを通過した被検ガスがこの電極面2bと含水板5の電解液との境界で接液して、電極体2, 3の電極面2b、3bの間にガスの濃度に対応した電解電流を発生させることになる。

【0012】この状態で、外部環境の湿度が上昇して電解液20が水分を吸収すると、電解液20の体積が増加することになるが、筒体1に収容されている電解液20は少量であるため、十分な空間21が確保されており、このため電解液20の増加分は空間21で十分に吸収されることになる。この電解液20の増量による空間気体の圧力上昇分は、通気孔18等から大気に放出されることになる。なお、電解液20は吸湿によりその濃度を或程度まで低下すると、吸湿力と蒸発量とが平衡するため、そのレベルを一定値に維持することになる。

【0013】一方、環境の湿度が低下して電解液20の水分の蒸発量が多い場合には、電解液20はその体積を減少させるものの、前述したように濃度の上昇に伴って吸湿力が上昇して或一定のレベルまで液面が低下した段階で減少が停止する。この状態でも電解液20に面している側の含水板4の一部は、依然として電解液に接液していて、含水板4全体に電解液を含んでいるから、電極体2, 3の電極面2b、3b間は、電解液を介して電解電池を構成することになる。言うまでもなく、ガス検出感度は電解液の濃度に依存せず、しかも湿度の変化に伴う電極体2, 3の歪も生じないので、湿度の大小に関わ

りなく実用上十分な精度を維持することができる。

【0014】なお、この実施例においては基準極10を用いた3極式に例を採って説明したが、作用極と対極からなる2極式のものに適用しても同様の作用を奏することは明らかである。又、この実施例においては基準極10を隔離した状態で配置しているが、図4に示したように含水板を介して密着させた状態に配置することにより、より一層の小型化を図ることができる。

【0015】すなわち、図4に示した実施例は、作用極を構成する電極体30と対極を構成する電極体31、及び基準極を構成する電極体32の間に、対極や基準極となる電極体31, 32よりも大きなサイズの含水板33, 34を挿入したり、また基準極32の他面に含水板35を当接させたりした上で、さらに電解液を収容する空間を確保するためのスペーサ部材36、さらには通気性の確保と、液漏を防止する隔膜37を重ね合わせ、これらを上面と底面の周縁部にリング38, 39を当ててケース等に圧接状態で収容し、スペーサ部材36により確保される空間に電解液を注入するようにしたものである。

【0016】この実施例によれば含水板33, 34, 35の各周縁部33a、34a、35aが圧接されるため、スペーサ36の空間に収容されている電解液が各含水板33, 34, 35の周縁部33a、34a、35aを伝って電極体30, 31, 32の電極面に到達し、前述と同様に電解電池を構成することになる。

【0017】さらに上述の実施例においては、電極体を挟む複数の含水板をその全周縁で接触させているが、図5(イ)に示したように含水板40の周縁に電解液が染渡ることができる程度の凸部40a、40a、40a・・・を形成し、電極体を挟む他方の含水板41と、この凸部40a、40a、40a・・・を介して接触させるようにすると、周縁部の圧接力が中央部に及ぶのを防止して皺の発生を防止することができる。

【0018】さらには、上述の実施例においては含水板を板状に形成しているが、図5(ロ)に示したように電解液に対向する側の含水板41に通孔41a、41a、41a・・・を設け、この通孔41a、41a、41a・・・により形成される空間に電解液を収容することにより容器の容積を小さくすることが可能となる。

【0019】また、上述の実施例においては、それぞれ独立した2枚の含水板により電極板をサンドイッチ状に包むようにしているが、糊状に溶解したセルロースを電極板の周縁まではみ出すように塗布し、これを乾燥させて電極体と一体となった含水板を形成しても同様の作用を奏することは明らかである。

【0020】さらには、上述の実施例においては各電極体2, 3をそれぞれ別々の段差部により支持するようにしているが、共通の段差部で受止めるようにしても同様の作用を奏することは明らかである。

【0021】又、上述の実施例においては対極となる電極体を隔膜の表面に形成しているが、基板に電極構成物質を蒸着したり、また物質そのもので形成した薄板を用いても同様の作用を奏することは明らかである。

【0022】図6(イ)(ロ)は、それぞれ本発明の他の実施例を示すものであって、図中符号50は、電解液に対して耐久性を備えた材料、例えばガラスウールで構成された濾紙を断面輪状となるように丸めて構成した給水部材で、端面50aのほぼ全体が含水板4に常時接して、かつ筒体部1の内部に空間21を十分確保できる程度の高密度、この実施例では筒体部1の内周面を一層で覆う程度に収容されている。

【0023】この実施例において、各部材を筒体1に組み付けた状態で、電解液注入口16から電解液を適量、つまり少なくとも含水板4、5、及び給水部材50が湿潤状態となる程度の量の電解液を注入して栓体15により密栓する。含水板4は、給水部材50の端面と接しているから、給水部材50との接触面で毛細管力により給水部材50に含まれている電解液を吸収する。そしてこれに接している含水板5が毛細管力により給水部材50から電解液を吸収する。給水板4の電解液はさらに吸水板5に吸収されて前述と同様に作用極2と対極3とを液絡させる。これにより、作用極2と対極3とが含水板5の電解液を介して電気化学的ガスセンサーを構成することになり、作用極2に接したガスの濃度に比例した電解電流を発生させることになる。

【0024】ところで、この実施例においては筒体1の内部にはその内周面を取り囲むように給水部材50が配置されているため、図7に示したように検出器が傾いて設置され、電解液20が底部の隅に片寄って存在している状態であっても、給水部材50は、その一部が常時電解液に接していて、電解液20を毛細管力により吸い上げて含水板4、5に供給するから、筒体1の姿勢に関りなく、つまり、含水板4が電解液20に直接接液してなくても、含水板5には電解液が常時供給されることになる。この結果作用極2と対極3とは、検出器本体の姿勢に関りなく常時液絡状態を維持できる。

【0025】外部環境の湿度が上昇して電解液20が水分を吸収すると、電解液20の体積が増加することになるが、筒体1に収容されている電解液20は少量であるため、十分な空間21が確保されており、このため電解液20の増加分は空間21で十分に吸収され、それ以上の分については通気孔18等から大気に放出されることになる。

【0026】一方、環境の湿度が低下して電解液20の水分の蒸発量が多い場合には、電解液20はその体積を減少させるものの、前述したように濃度の上昇に伴って吸湿力が上昇して或一定のレベルまで液面が低下した段階で減少が停止する。この状態でも、含水板4、5、及び給水部材50には依然として電解液が含まれているか

ら、電極体2、3の電極面2b、3b間は、電解液を介して電解電池を構成することになる。

【0027】なお、この実施例においては一重巻きとしているが、筒体に空間を確保できる程度に複数回巻きに構成すれば、一層確実に電解液を電極体2、3に供給することができる。

【0028】またこの実施例においてはシート状の給水紙の形を整えて筒体に収容しているが、図8に示したように、ポリオレフィン系高分子のような比較的剛性強度が大きく、かつ親水性を備えた多孔質高分子材料(例えば「サンファインAQ」(登録商標))を射出成形したり、切削加工したり、またセラミック粉末を目的の形状に焼結したり、切削加工したり、さらにはセルロースにより目的形状物を構成後、高分子材料で補強したりして容器に収容可能なサイズに筒状に成形し、これを給水部材として用いても同様の作用を奏することは明らかである。

【0029】図9は、前述した筒状の給水部材が持つ剛性を積極的に利用したもので、筒状部52aの少なくとも含水板4に当接する側を同一材料からなる平面部52bで封鎖したもので、全体の長さが容器1の空間21の高さにほぼ一致するように選択してカップ状に構成されている。このような給水部材は、ポリオレフィン系高分子のような比較的剛性強度が大きく、かつ親水性を備えた多孔質高分子材料(例えば「サンファインAQ」(登録商標))を射出成形したり、切削加工したり、またセラミック粉末を目的の形状に焼結したり、切削加工したり、さらにはセルロースにより目的形状物を構成後、高分子材料で補強したりして構成することができる。

【0030】このように構成した給水部材52を図10に示したように検出器を構成している筒体1の空間21に挿入して電解液を注入すると、電解液20に直接接している筒状部52aを伝って平面部52bまで移動した電解液は、平面部52bに接している含水板4に吸収されてその周縁部から含水板5に移動し、以後前述と同様に電極体2、3に行き渡る。ところで、給水部材52は、図中上部が平面部52bにより封鎖されて含水板4の全面に接しているから、電極体2、3を常時支持することになり、圧力の急激な変動による電極体2、3の湾曲を受け止めて、電極材2、3が空間側に陥没するのを防止することになる。いうまでもなく、この実施例においても、給水部材52が筒状に形成されていて内部に空間52cを有するから、空間21に挿入しても吸湿による電解液の増量分を吸収できる程度の余分な空間を確保できることは明らかである。

【0031】なお、上述の実施例においては、筒状部52aと平面部52bとを一体に形成しているが、筒状体とこれの開口を封止できる円板に分けて構成し、これらを重ね合わせて使用しても同様の作用を奏することは明らかである。

【0032】

【発明の効果】以上説明したように本発明においては、作用極と対極とで電解液の吸収が可能な第一の含水板を挟み、また対極の電解液側には対極の周縁部よりも外側に延出する電解液の吸収が可能な第二の含水板を当接させ、第二の含水板の少なくとも一部を電解液に接しさせたので、電極に通孔を穿設して紐状部材を導通させる作業が不要となって、電極の実行面積を増加させることができるばかりでなく、製造工程の簡素化を図ることができる。

【図面の簡単な説明】

【図1】本発明の一実施例を示す断面図である。

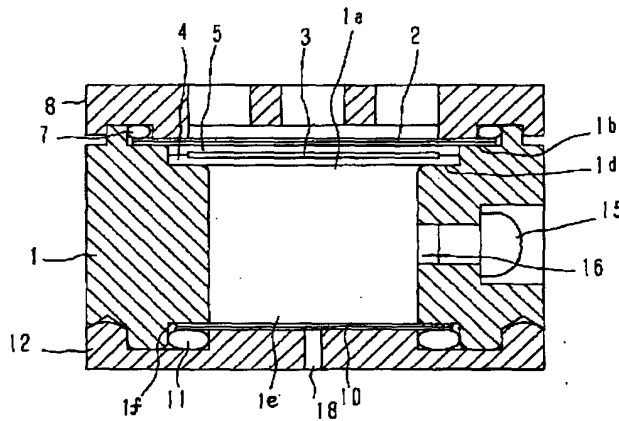
【図2】図(イ)、(ロ)は、それぞれ電極部を拡大して示す図である。

【図3】同上装置の使用状態を示す図である。

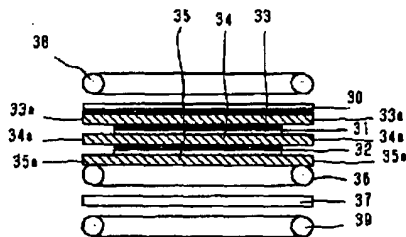
【図4】本発明の他の実施例を示す断面構造図である。

【図5】図(イ)、(ロ)はそれぞれ含水板の他の実施例を示す図である。

【図1】



【図4】



【図6】図(イ)、(ロ)は、本発明の他の実施例を示す装置の断面図である。

【図7】同上装置の使用状態を示す図である。

【図8】給水部材の他の実施例を示す斜視図である。

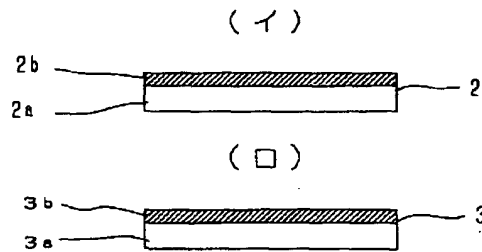
【図9】図(イ)、(ロ)は、それぞれ給水部材の他の実施例を示す斜視図と断面図である。

【図10】同上給水部材を使用した検出器の一実施例を示す断面図である。

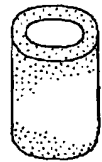
【符号の説明】

- 10 筒体
2, 3 電極体
2a, 3a 隔膜
2b, 3b 電極面
4, 5 含水板
8, 12 枠体
20 電解液
50 給水部材

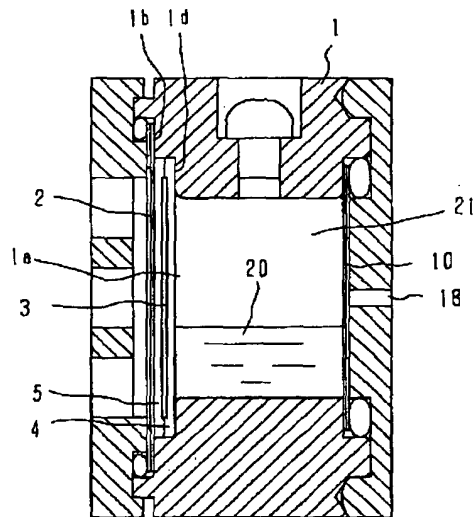
【図2】



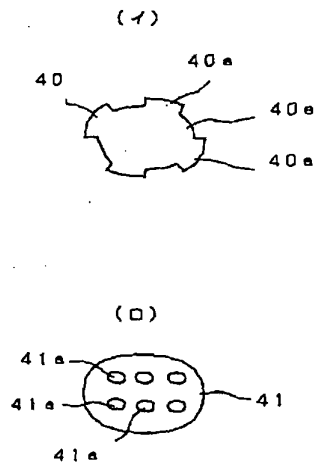
【図8】



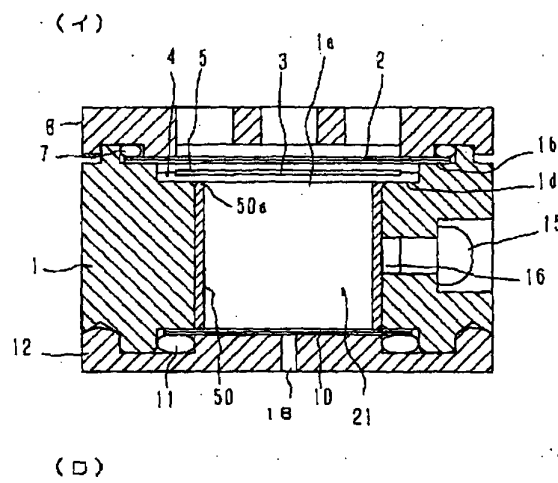
【図3】



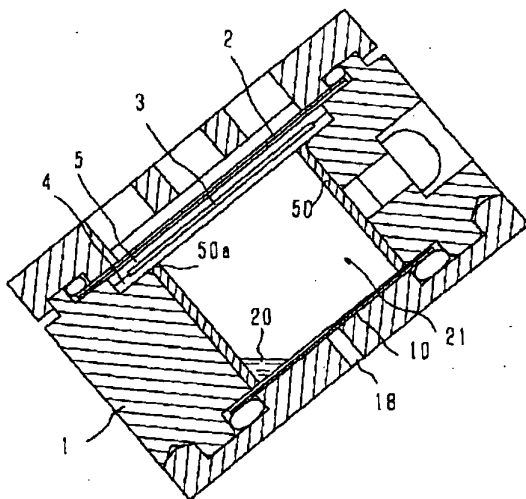
【図5】



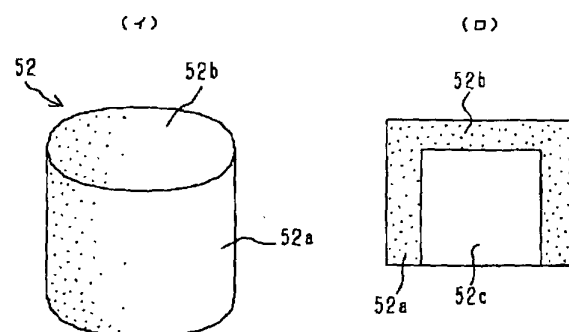
【図6】



【図7】



【図9】



【☒ 1 0】

